

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Malaysia is fortunate that it is not directly affected by serious disasters like earthquake, hurricanes, typhoon, tornadoes, tsunamis and volcanic eruptions. This country is also rich in water resources, receiving an abundant amount of rain every year. The average annual rainfall is 2,400 mm for Peninsular Malaysia, 3,800 mm for Sarawak and 2,600 mm for Sabah.

Even though Malaysia has seemingly sufficient water resources to meet all our needs for the foreseeable future and not too excessive as compared to other countries, there are some water-related problems which have raised concerns among water engineers and the public. The problems are not about having too little water to satisfy our needs, as in some water-scarce countries in the world, or too much to cope with, rather, it is a problem of not managing water effectively to achieve our desired objectives. In some river basins, there is already the problem of water shortage especially during periods of prolong droughts, and conversely, the problem of excessive water and floods during the wet season.

Increasingly, as we move to future, the country is expected to face serious challenges relating to flood and drought management. Per capita availability of water will greatly decrease as a result of a growing population and greater per capita use of water for a better quality of life, urbanization and industrialization. Other potential problems include increased severity and frequency of flash floods, prolong droughts especially during El-Nino years, water and land use conflicts, decreasing crop yields and increasing

water demand for food production, pollution control, outbreak of water-borne diseases, declining aquatic biodiversity, deforestation, and uncontrolled erosion and sedimentation.

There are two major water-related problems affecting this country, which are excess water known as floods and water shortage known as droughts. Parallel to the growth in population and the good economic environment over the years which has resulted in extensive industrialization have imposed a continuously increasing water demand, and to some extent, caused water stress to certain regions of the country where the demand has exceeded the carrying capacity of the river basins. These problems have disrupted the quality of life and economic growth in the country and can result in severe damage and loss of properties, and occasionally loss of human lives as can be seen in the recent December 2006 and January 2007 floods in Johor as well as the 1998 prolong water rationing widespread in the Klang Valley area.

Although the annual rainfall is very high (3,000 mm average) there are large variations both in time and in space, and river flows are prone to large fluctuations as well. Hence Malaysia is subject to prolong dry periods which can easily affect its freshwater supply. This has led to drought occurrences in the past with the most notable phenomena that is El Nino. It is related to drought which caused extensive impact to the environment, economic and social activities of the whole nation. In some parts of the country such as Selangor, Sarawak and Sabah, the prolong drought resulted in a lowering of the ground water table especially in peat areas, and consequently many cases of extensive forest fires. The local air quality condition became worse because of the thick haze blown from forest fires both locally and from neighbouring countries. Such a situation persisted for months and posed a serious threat to the health of the people.

Due to this problem, there are numbers of software which are designed to analyze rainfall and runoff process. One of them is Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) which is used to predict rainfall data and to determine runoff process. The parameter estimations HEC-HMS hydrologic model are structure of the model, analysis of sensitivity, results obtained from the data and calibration and verification procedures. By using HEC-HMS hydrologic model, the rainfall-runoff relationship can be obtained by producing a hydrograph. The hydrograph of extreme

floods and stages corresponding to flood peaks provide valuable data for purposes of hydrologic design. Further of the various characteristics of the flood hydrograph, probably the most important and widely used parameter is the flood peak. At a given location in stream, flood peaks vary from year to year and their magnitude constitutes a hydrologic series which enable to assign a frequency to a given flood-peak value.

1.2 PROBLEM STATEMENT

Most of the river in Malaysia including the Selangor River basin have very limited gauging stations especially for streamflow which cover only small part of the catchment area. To construct a station may cost a lot, thus, HEC-HMS is used to analyzed the hydrologic process and estimate the streamflow of ungauged river basin of Selangor River. In addition, there is no gauging station at the downstream area that cause the difficulties to get information. Streamflow data at downstream area is important in hydrological study particularly for slat intrusion and coastal flooding. Although can perform hydraulic modelling, it would require excessive survey data such as river cross-sectional area. This survey is costly and time consuming. It is an effort to seek for alternative approach for estimating discharge in downstream part of the river using satellite data and hydrological modelling.

Besides that, the peak discharge and volume of runoff for a given infiltration rate will increase with the increases of rainfall intensity. To overcome this problem, HEC-HMS is used to analyze the hydrologic process and to determine the rainfall-runoff process of Selangor River. The software includes hydrologic analysis procedures such as infiltration, unit hydrographs, and hydrologic routing. HEC-HMS also includes procedures necessary for continuous simulation.

1.3 OBJECTIVE

- i. This study aims to estimate the streamflow in ungauged catchment within the Selangor basin projecting the calibrated daily discharge using HEC-HMS model. HEC-HMS model was developed by the US Army Corps of Engineers (Feldman,